Voyager 1 most distant man-made object in space

The Voyager 1 spacecraft has set another record and become the explorer that has traveled farthest from home.

At approximately 4:10 p.m. JSC time Feb. 17, Voyager 1, launched more than two decades ago, cruised beyond the Pioneer 10 spacecraft and became the most distant human-created object in space, at 6.5 billion miles from Earth. The two are headed in almost opposite directions away from the Sun.

"At almost 70 times farther from the Sun than the Earth, Voyager 1 is at the very edge of the solar system," said Dr. Edward Stone, Voyager project scientist and director of NASA's Jet Propulsion Laboratory.

"The reason we can continue to operate at such great distances from the Sun is because we have radioisotope thermal electric generators on the spacecraft that create electricity and keep the spacecraft operating."

"The fact that the spacecraft is still returning data is a remarkable technical achievement," Stone said.

Voyager 1 was launched from Cape Canaveral on Sept. 5, 1977. The spacecraft encountered Jupiter on March 5, 1979, and Saturn on Nov. 12, 1980.

After a close fly-by of Saturn's large moon Titan, Voyager 1's path was bent northward by Saturn's gravity, sending the spacecraft out of the ecliptic plane—the plane in which all the planets except Pluto orbit the Sun.

Launched on March 2, 1972, the Pioneer 10 mission officially ended on March 31, 1997. However, Ames Research Center intermittently receives science data from Pioneer as part of a training program for flight controllers of the Lunar Prospector spacecraft now orbiting the Moon.

"The Voyager mission today presents an unequalled technical challenge. The spacecraft are now so far from home that it takes nine hours and 36 minutes for a radio signal traveling at the speed of light to reach Earth," said Ed Massey, project manager for the Voyager Interstellar Mission at JPL. "That signal, produced by a 20 watt radio transmitter, is so faint that the amount of power reaching our antennas is 20 billion times smaller than the power of a digital watch battery."

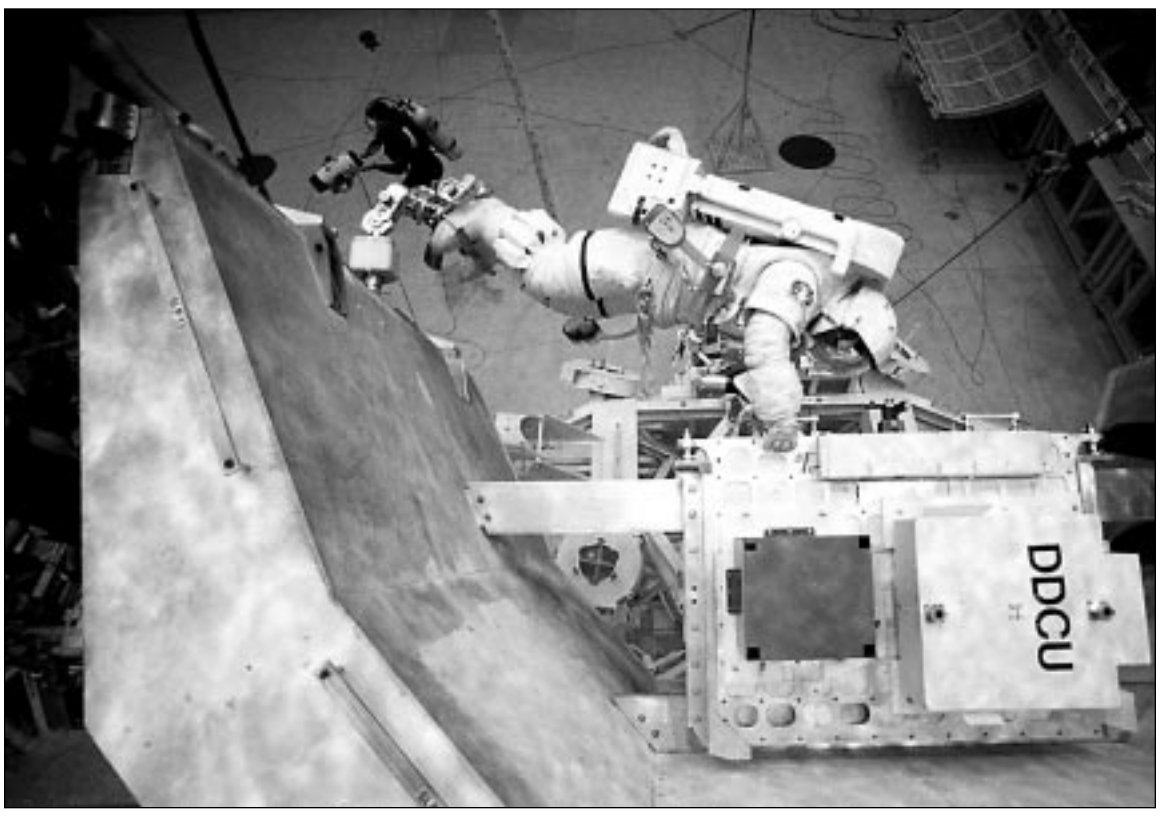
Having completed their planetary explorations, Voyager 1 and its twin, Voyager 2, are studying the environment of space in the outer Solar System. Science instruments on both spacecraft sense signals that scientists believe are coming from the outermost edge of the Sun's magnetic field, known as the heliopause.

In this zone the solar wind abruptly slows down from supersonic to subsonic speed, creating a termination shock. Before the spacecraft travel beyond the heliopause into interstellar space, they will pass through this termination shock.

"The data coming back from Voyager now suggest that we may pass through the termination shock in the next three to five years," Stone said. "If that's the case, then one would expect that within 10 years or so we would actually be very close to penetrating the heliopause itself and entering into interstellar space for the first time."

Encountering the termination shock and heliopause has been a long-sought goal for many space physicists, and exactly where these two boundaries are located and what they are like still remains a mystery.

Science data transmitted are received by the Deep Space Network antennas located in California, Australia and Spain. Both spacecraft have enough electricity and attitude control propellant to continue operating until about 2020. At that time, Voyager 1 will be almost 150 times farther from the Sun than the Earth—almost 14 billion miles away.



JSC Photo S98-00937 by Mark Sowa

ORU READY?—Astronaut Leroy Chiao evaluates one concept for a logistics carrier to deliver Orbital Replacement Units to the International Space Station. Chiao and Dan Bursch were using a Spacelab pallet mockup to see how well space walkers could work with replacement units on that particular carrier. The pair was among a number of astronauts involved in a two-week series of underwater simulations of maintenance procedures in the Neutral Buoyancy Laboratory in late January. Other simulations involved testing of methods for translating equipment along the truss assemblies of the station using the Crew and Equipment Translation Aid Cart and an Orbital Transfer Device, also known as the EVA crane, which flew as a demonstration unit on the STS-87 mission. Subjects also evaluated station maintenance work sites and tasks off two faces on one of the truss segments.

Shuttle managers delay Neurolab launch two weeks

NASA managers have decided to postpone for two weeks the launch of the STS-90 Neurolab flight, setting a new target date of April 16. The delay will permit better utilization of available shuttle resources to support shuttle processing.

Commander Rick Searfoss, Pilot Scott Altman, Mission Specialists Rick Linnehan, Dafydd Rhys Williams, Kay Hire, and Payload Specialists Jay Buckey and Jim Pawelczyk, have completed the crew equipment interface test and are continuing their training. The crew will fly to Florida for the terminal countdown demonstration test, a final dress rehearsal of the launch, March 30-31.

Technicians at Kennedy Space Center continue to prepare *Columbia* and its long Spacelab module for the 16-day flight. The Neurolab interface verification test has been completed, and the tunnel adapter was installed Monday in the Orbiter Processing Facility hangar. *Columbia*'s main engines were installed Tuesday.

The external tank and solid rocket boosters were scheduled to be mated Thursday, and *Columbia* is set to roll over to the Vehicle Assembly Bldg. on March 16.

The goal of the 16-day life sciences mission is to increase the understanding of the mechanisms responsible for neurologic and behavioral changes that occur in space flight and to apply results from space studies to the health, well-being, and economic benefits of people on Earth.

The Neurolab payload consists of 26 human and non-human scientific experiments and associated hardware in a Spacelab long module and the orbiter middeck. The experiment disciplines are primarily involved with life science investigations utilizing human subjects and laboratory animals.

To support the long mission, the shuttle will be configured with an extended duration orbiter system to generate electricity and life support consumables.

Scientists view first close-ups of Martain polar terrain

Swirling bands of eroded, layered rock, reminiscent of the edges of Alaskan ice sheets blanket the frigid floor of Mars' south pole. NASA's newly named Mars Polar Lander will touch down in this uncharted territory in late 1999 to dig for traces of frozen, subsurface water.

New images of the landing zone for the Mars Polar Lander, taken by the camera aboard NASA's Mars Global Surveyor, confirm the strange, layered terrain in the south polar region. This represents a dramatic departure from the Martian landscapes observed by the Viking landers and Mars Pathfinder.

"Despite ground fog that obscures part of the surface in these images, we can see much more surface detail than we've ever seen before, which suggests that the 75-degree south latitude landing zone is quite a bit more rugged and geologically diverse than we had previously thought," said Michael Malin, principal investigator for the Global Surveyor camera and the cameras on the Mars Polar Lander and its newly named partner, the Mars Climate Orbiter.

Current images from Mars Global Surveyor show objects as small as 48 feet across can be seen. Once in its final mapping orbit, the camera will be able to distinguish ground features as small as seven to nine feet across. This greater clarity will enable views of objects as small as boulders or as subtle as sand dunes.

Over the next year, Global Surveyor images will be used with other data to better characterize the geology of the Martian south pole. Once in its mapping orbit, data from the spacecraft's laser altimeter will measure the height and roughness of Martian surface features and will aid the final choice of landing sites.

"We have a wonderful opportunity in the next year to study this region with data from Mars Global Surveyor, which underscores the true advantage of conducting a continuing program of Mars exploration," said Dr. John McNamee, Mars Surveyor '98 project manager at NASA's Jet Propulsion Laboratory. "We will be able to characterize the geology of the whole region and find the best spot to land, one that presents a balance between lander safety and scientific interest. This process does not have to be finalized until June 1999, five months after the lander has been launched and six months before it lands."

Piggybacking on the Mars Polar Lander are two small 4.5-pound microprobes. Deployed before landing, they will penetrate and embed themselves beneath the Martian surface to study subsurface materials.

Mars Polar Lander and the Mars Climate Orbiter are designed to learn more about the history of Mars' climate and the behavior of volatiles, such as water vapor and ground ice. The climate orbiter, scheduled for launch Dec. 10, will profile the Martian atmosphere and map its surface. The polar lander, scheduled for liftoff Jan. 3, 1999, will search for traces of subsurface water and any evidence of climate change.

Shock wave sheds light on supernova

NASA's Hubble Space Telescope is giving astronomers a ringside seat to a never before seen titanic collision of an onrushing stellar shock wave with an eerie glowing gas ring encircling a nearby stellar explosion, called supernova 1987A.

Though the star's self-destruction was first seen nearly 11 years ago on Feb. 23, 1987, astronomers are just now beginning to witness its tidal wave of energy reaching the "shoreline" of the light-year wide ring.

Shocked by the 40-million mile per hour sledgehammer blow, a 100-billion mile diameter knot of gas in a piece of the ring already has begun to "light up," as its temperature surges from a few thousand degrees to a million degrees Fahrenheit.

"We are beginning to see the signature of the collision, the hammer hitting the bell. This event will allow us to validate ideas we have built up over the past 10 years of observation," says Robert Kirshner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "By lighting up the ring, the supernova is exposing its own past."

Astronomers predict it's only a matter of years before the complete ring becomes ablaze with light as it absorbs the full force of the crash.

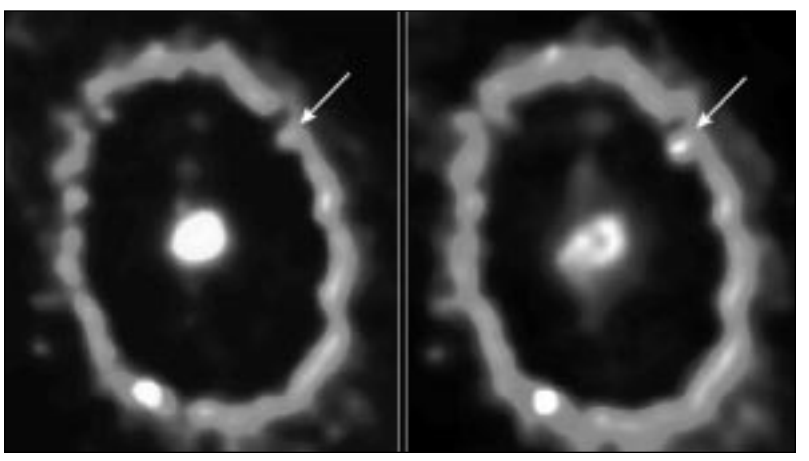
Illuminating the surrounding space like a flashlight in a smoky room, the glowing ring is expected to shed a brilliant new light on many unanswered mysteries of the supernova:

What was the progenitor star?

Was it a single star or binary system?

Are a pair of bizarre outer rings attached to an invisible envelope of gas connecting the entire system?

"We have a unique opportunity to probe structure around the supernova and uncover new clues to the final years of the progenitor star before it exploded," adds Richard McCray of the University of Colorado in Boulder, Colo. "The initial supernova flash only lit up a small part of the gas that surrounds the supernova. Most of it is still invisible. But the light from the crash will give us a chance to see this invisible matter for the first time, and then perhaps we can unravel the mystery of the outer rings."



NASA Photo

These NASA Hubble Space Telescope Wide Field and Planetary Camera 2 images show the glowing gas ring around supernova 1987A. Left, the supernova in 1994, shows a brightening knot on the upper right side of the ring. This is the site of a powerful collision between an outward moving blast wave and the innermost parts of the circumstellar ring. Right, the collision heating the gas has caused it to brighten in recent months.